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ABSTRACT

This paper explains and summarizes the results of a study that investigated the ways in which monozygotic (identical) and dizygotic (fraternal) twins learn. Their individual learning style elements were specifically investigated according to the Dunn and Dunn model. This paper discusses the themes, unique needs, and characteristics monozygotic twins expressed in the interview process, especially as they are relevant to teachers and teacher education programs. (WRM)

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Gleanings from Identical Twins Studying Science

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Gleanings from Identical Twins Studying Science

This paper explains and summarizes some of the results of a study that investigated the ways in which monozygotic (identical) and dizygotic (fraternal) twins learn. It specifically investigated their individual learning style elements according to the Dunn & Dunn (1977, 1996) model. The research consisted of administering the Dunn, Dunn, & Price (1980) Learning Style Inventory along with a series of interviews, document collections, and grounded surveys. What is discussed here are the themes, unique needs, and characteristics monozygotic twins expressed in the interview process. The qualitative data collected from the interviews was most illuminating. The data are classified into five principle themes that are relevant to teachers and teacher education programs.

Previous Twin Research

Many of the studies involving twins have indicated they share various common traits, aptitudes, and academic achievement records (Bouchard, Lykken, McGue, Segal, & Tellgen, 1990; Wilson, 1986; Segal 1985). Some studies such as the Bouchard Minnesota Twin study compared the psychological and intelligence quotients of identical twins reared apart and found many striking similarities (Wilson, 1983). Some of these similarities were attributed to

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the effect of heredity. However, few studies have evaluated how twins learn (Wright, 1997). Fewer studies have focused on the qualitative aspects and the relationship between twinship and learning. The purpose of this research was to qualitatively look at the unique experiences identical twins have had in their formal and informal learning.

This study involved four pairs of identical twins who had pursued studies preparing them for science related professions. Each individual was interviewed on three separate occasions and was given the Dunn, Dunn, & Price Learning Style Inventory. Three pilot studies prepared the researcher and refined the methodology for this study. Grounded surveys, document collection, and member checks were also an important part of collecting, analyzing, and clarifying research data.

The participants in this study were of adult age and had completed secondary school, thus having the opportunity to reflect on at least twelve years of their formal and informal learning experiences. Each pair of twins was selected based in part on their decision to pursue science-related professions, along with a history of strong academic achievement. Three of the pairs of twins were male, one pair was female.

The data, once collected, transcribed, coded, and analyzed, revealed many insightful vignettes. The twin siblings revealed subtle but significant differences in how they learn. For example, several of the participants in this study discussed specific study strategies, such as the reliance of tactual (writing) techniques or the use of unique sleep-study cycles. Such strategies were not shared by their sibling twin. The stories each individual told often revealed unique challenges that being a twin posed in learning situations.

Five Themes and Specific Examples

Five themes emerged across the four sets of twins. These themes are discussed in general and followed by some of the vignettes and experiences shared by the twins in the interviews.

1. The influence and importance of participating in non-formal learning experiences was cited as an important part of developing an interest in science. However, even though a set of twins may have been involved in an experience, such as scouting, each had decided to pursue different scientific disciplines and continued to explore different interests.

This theme surfaced frequently as many individuals spoke of early learning experiences they had beyond their formal school experiences. They frequently spoke of individuals who taught them how to satisfy their curiosity for learning. Dan and Mike spoke of the tragic but significant event in their life when their father was involved in a serious automobile accident. They became involved as adolescents in learning information relating to their father's condition and his treatments. Their informal education included many conversations with the physicians and nurses attending their father, as well as; reading and researching medical literature to help them and their mother understand / make medical decisions. It was during these informal learning experiences that Mike and Dan first began thinking of the medical profession as a possible career. Both agreed that these informal and the on-going medical issues with their father had a significant role in their decisions to study medicine.

Other significant informal learning experiences that both Mike and Dan shared were educational family vacations with their parents. They recalled visiting historical sites, reading

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and using maps, and learning about places they visited. Such experiences, they agreed, had given them a genuine interest and love of learning which contributed to their academic success. They continue to use skills and enjoy such learning experiences as adults. Mike and Dan reported that they continue to enjoy map reading and educational travel today.

John and Jeff, a set of identical twins studying nursing (RN) as a career, reported another example of a significant informal learning experience. Their mother was employed at a large metropolitan hospital as a receptionist. As children they would often accompany her to the hospital and investigate, ask questions, and explore the surroundings. They were also fascinated and attentive to the stories their mother would relate at home regarding medical emergencies or hospital treatments. They spoke favorably of such experiences and how they figured into their decision to study to become registered nurses. They also had plans of using their medical knowledge as paramedics as well.

At one point Jeff was hospitalized and both he and John experienced the care and work of registered nurses. This too, gave them insight into hospital work. It was one of many informal hospital learning experiences for them.

Jill and Ann spoke of the significance their parents had, especially their father, in helping them with homework and maintaining high academic expectations. Ann recalled the times their father would give detailed explanations of how to repair mechanical devices. Their father's engineering background yielded information and curiosity about how objects work. This was shared with his daughters who expressed a sense of that curiosity in their personal and career pursuits.

In the case of Carl and Jay, it was the informal education they received from scouting that helped motivate them to become active and enthusiastic learners. Their experiences with

a very knowledgeable and patient scoutmaster helped them decide to study science in college. Their parents too encouraged their continual learning. Carl and Jay recalled the camping and traveling experiences they had in their youth, and how such experiences contributed to an appreciation and respect for the natural world, as well as a continued interest in science.

2. Each twin pair repeatedly discussed the role of competition in their learning experiences. Although the competition was viewed favorably by three of the four pairs of twins, the expectation to compete was frequently reported. Their family, peers, and teachers often projected such an expectation toward the twins, whether intentional or not.

For Ann and Jill the competition was unique and pivotal to their academic pursuits. Early in elementary school Jill deliberately decided to excel in certain subjects that her twin sister did not. She also recalled being compared to her twin sibling by her mother. Jill explains:

> Yeah, I think probably a little bit... (We were often compared and competed.) I don't know if it was so much from our perspective, as from my parents, at least my mother's. I remember being compared a lot, and like Ann getting into National Honor Society before I did or getting some honor or something. That being kind of a big deal, kind of pressure on me to accomplish that. I think in a way it was intended to be a motivater. But everything we've done has always been kind of, if she was good at something, I really didn't try to be good at that thing. And so in school, it was like she was really good at math and science, and I was perfectly willing to be horrible at that, and be good at other subjects. I think we always tried to be conscious of that, not like excel at the same thing, to do our own thing so we wouldn't be in competition with each other. (27Ji.2.1)

Jill continued to explain that her teachers and other adults often made comparisons as well. She explains further that some people seemed to expect one of them to be "better" than the other in specific subjects, hobbies, or athletic events.

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> You were always compared. But I think we tried *not* to be. We were so much viewed as one entity, that if she was good at something, I should be good at it. I think it motivated us to try and be *different*, so we would have our own identities, and we did that in a lot of different areas, including academics. And I always had in my mind, feeling, 'Oh, she's smarter than me in math, in science, and all that kind of stuff.' But I don't know how much of that was really true and how much of that was just kind of self-imposed. (27Ji.2.1)

In the course of the interviews Ann revealed that she actually looked up to Jill for her willingness to take risks, being the one person in their family that lived her life according to her own goals. Ann expressed that she admired that in her sister.

Jeff and John each expressed the idea that since they knew each other's academic potential, they held each other accountable for living up to their potential. It was viewed as a positive influence on their academic work. Dan and Mike echoed the same sentiment regarding their academic abilities. They expressed the idea that when one of them did well, it helped motivate the other to do well in other academic tasks.

Jay and Carl mentioned that when they were in their senior year in high school they felt an expectation from their peers, teachers, and even school counselors to compete for their class rank. It was for a time an issue of whether they would be influenced by the college choice of their twin sibling. Eventually both chose the same university because they both thought it was the best place for them and their academic pursuits, not because their brother had chosen that university. At times they felt they had to justify their decision to others. They did pursue different programs and chose to spend time apart for during their undergraduate college programs and activities (Jay majored in biology and Carl majored in chemistry).

3. The success of each twin as a learner was positively correlated to <u>their knowledge and application of specific study strategies that were consistent with their learning style</u>. In other words, each individual revealed concrete examples of study strategies that helped them learn new or difficult information. These strategies were consistent with their learning styles. However, twin siblings seldom shared common learning style strengths.

These four pairs of twins were academically successful and were able to give specifics about how they studied and the conditions in which they could be most productive as learners. They were able to list specifics of their personal learning styles that were often different from their twin sibling. This was perhaps one of the most productive areas of this study in that it supports research on learning styles that emphasizes: knowing and implementing one's learning style leads to improved academic achievement, learning efficiency, and attitude.

One of the more unique study strategies was Dan's use of a small memo notebook on his rounds and duties as a medical student. However, instead of using it to actually record words or notes, he would use it as a tactual device to make squiggles while he was listening or being exposed to new or difficult information. When studying at home, he often did the same. He would have a tablet of paper near his desk on which he would make writing movements and lines as he read or reviewed difficult information. He specifically stated that the mere act of being tactually involved while he read or heard information helped him process that information. When Dan was asked if he tried just moving his finger over a tablet surface instead of actually writing nonsensical lines with a pen or pencil, he responded that he had tried that but it was not as effective. Mike did not use any such tactual technique.

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Jay recounted times he would make maximum use of his study time under pressure by employing a sleep-study cycle. Jay explains:

> I call it my sleep-study cycle. My favorite way to study is, what I'd like to do is, I'll study that material, especially if you're reading a book, and science books and things can get pretty dry. So I'll read it for a while, and there's only so long that I can concentrate on the material. The concentrating I do is really intense and then it almost wears you out mentally after a while, like after studying for quite a while. I kind of like, ugh, 'what did I just read?' When I get to that point.... I shut the book and I'll actually just take a short nap, maybe a half-hour. So I just go to sleep, wake up, and then start studying again, as long as I have, you know, food or whatever. I can do that for hours on end. Just sleep, study, sleep, study, and it's weird cause I won't get the traditional seven hours of sleep. Whatever I sleep, if I'll sleep-study, I can do that over a twenty-four or forty-eight hour cycle. (9J.1.3)

Jay went on to explain that he has monitored his sleep-study cycles and he's reported that such cycles are an efficient use of his study time. He reported being able to remember the information following such cycles and having produced some very good papers using this strategy. He also reported times when he would, "just sit there and relax and rest my mind, almost like a meditation, just for about ten to fifteen minutes, and then I'll get myself up and study again." (10.J.1.3) Carl did not report using or even being aware of his brother's sleep-study cycle.

Carl and Jay also reported having different preferences when it came to formal or informal environments. Carl preferred a more formal or traditionally quiet desk and table arrangement in which to study. He usually resorted to a computer space at the university library to study. Jay preferred a more informal study area, which usually was in his dorm room in a comfortable chair. Jay reported trying to study at the library under more formal conditions, but he would usually resort to going back to his dorm bedroom and feeling more comfortable and productive there.

In the case of Ann and Jill, there was a marked difference in their perceptual modality preferences that contributed to their miscommunication at times. Ann's perceptual learning style strengths were visual and tactual, while Jill's preference was for the auditory mode. Each explained that these different preferences actually lead to communication problems between them. Ann would rely and recall auditory information more readily than other forms, and Jill often preferred or required visual or tactual means of communication. Jill often referred to instances when she would recall what others had said to her verbatim, and this would often amaze or confound them because they did not have such a comprehensive recall of auditory information. Ann, on the other hand, would often openly use auditory mode to share ideas with Jill, not expecting to have such auditory ideas taken as her "final" decisions. Ann's strong preference would be for final ideas / plans to be written down or involve tactual or visual representations. This was one case where discordant perceptual modalities were interfering with twin sibling communication.

John and Jeff both had a perceptual preference for auditory but Jeff had an additional preference for tactual experiences. Carl and Jay shared one perceptual strength, kinesthetic modality; however, Carl also had an auditory strength as well. Contrary to what many may have expected these four pairs shared few of their perceptual strengths or other learning style elements of the Dunn learning style model.

4. The participants reported instances in which being a twin actually served advantageous in learning situations. For example, it often led to early name recognition and greater attention because many teachers and their peers expressed a personal interest in twin experiences.

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Jeff recalled how he liked having a twin brother because it was motivational for him, especially in learning situations. Jeff and John would often choose each other as lab partners in some of their college nursing courses, although they both expressed the case that they do not study together or review for exams together, and actually prefer to work alone when learning / studying.

Jay and Carl recalled times when they would be singled out by instructors in their formal school experiences. Such occasions would often allow them to receive attention, which lead to early name recognition. It was also an opportunity for instructors to later see them as individuals. One professor, having taught them each a college science course in chemistry, commented that Jay and Carl approached chemistry from their own unique perspectives. Carl remarked that he liked being recognized for his own abilities and liked the informal conversations he would have with some of his professors during their office hours.

Another advantage of being a twin, according to John and Jeff, Jay and Carl, and Mike and Dan is that of having someone with whom you can communicate efficiently. Their peers and friends were often amazed at the conversations between twin siblings. The ease and brevity of conversations between twins was often reported. The communication patterns were unique largely due to these twins having such a common and shared history of experiences. It is similar to married spouses who may communicate entire thoughts or ideas with a simple expression or trite phrase unrecognizable to observers.

Jill and Ann also supported the idea that often times group work / group learning situations were ineffective for them largely because such groups were often disorganized and inefficient ways to meet specific objectives. This sentiment was echoed by all four of these pairs of twins. Their initial preference for study or learning arrangements were for each

sibling to work alone. A second grouping option was to work with others who were as motivated as themselves. However, contrary to what one might expect, none of these individuals preferred learning in groups, or even learning with their twin sibling. In all of the twins interviewed their expressed social preference for learning was alone / by themselves.

All of these individuals also expressed frustration at not being given options to work alone in school situations. Group work, especially in large groups of five or more, was one of the worst ways to communicate and process information for Dan and Mike. They echoed the sentiment of the other three pairs when they commented that ' if you want us to do poorly at a learning task, put us in a large group situation.'

5. The participants in this study, especially in learning environments, commonly expressed the need for individual recognition and individual identity. The need and the struggle to be viewed as individuals, without always being compared to their twin sibling, was frequently expressed. This theme revealed the unique challenges of being thought of as an individual when at times even long-time close friends and teachers would make incorrect assumptions and unfair comparisons.

Each pair interviewed expressed struggling with their establishing an individual identity apart from their sibling twin. John and Jeff went so far to say that they often spend more time on the weekends at their girlfriend's home and with her family because there they were seldom compared with their brother. They would frequently study at their girlfriends' houses rather than at their own home.

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Dan and Mike expressed concern over drawing too much attention to themselves as twins in medical school and around the hospital. They would often commute to school or the hospital together; however, one would enter the building before the other or by using a separate entrance to avoid being seen together and thus attracting stares / being considered as 'a unit.' Dan and Mike commented that even some of their long-time friends would not always distinguish between their individual preferences and mannerisms.

John and Jeff expressed the same struggle with their parents and with the people they worked with at the hospital. When one had done an excellent job or was commended, the compliment was often awarded to "the twins." Their parents too, would at times consider them as sharing the blame or accommodation for specific accomplishments or mistakes made by only one of them.

As mentioned earlier, Jill and Ann had expressed the need and attempt to develop individual identities by choosing carefully the subjects in which they would excel. They too, regretted the times they would be expected to compete with each other in academic and non-academic situations. They also regretted the times they were expected to be alike or show similar preferences for recreational activities. For example, as children, if Ann wanted to see a particular movie, it was sometimes assumed that Jill wanted to see it as well.

Carl and Jay expressed their sentiments regarding their choices to attend different graduate schools and finally being apart from each other after seventeen years of attending the same academic institutions. Carl expressed it this way: "in graduate school it will be 'Carl,' not 'Carl, the twin.' No one will even know I'm a twin unless I choose to tell them."

All of the twins in this study expressed a preference for being called by their name, even if they were mistaken for their twin sibling, and called by their name. They would much

prefer that instead of being referred to as "the twins," or as one of the "Smith twins," or by some other unifying phrase. This too, was observed as a way of avoiding acknowledging their individuality by their peers and teachers.

The Importance of these Themes

These vignettes and the emergent themes illuminate the need for parents, teachers, and friends of twins to become aware of their own behaviors and the consequences of those behaviors on twins and their learning. What follows are some key points and applications that educators and parents could be made aware.

- Parents and adults should encourage and engage twins in informal and non-formal learning activities, especially in the early, elementary, middle, and upper grades.
- Acknowledge each twin as having individual learning preferences and get to know twins as individuals.
- Be wary of competition between twins, especially when such competition involves academic performance.
- Encourage and help each twin to discover, develop, and accommodate their individual learning style preferences.

Such detailed and rich stories told by twins about their learning experiences indicated the need and value of continued qualitative research on twins and their learning styles. A recently published book: *Twin and Triplet Psychology: A Professional Guide to Working with Multiples*, (Sandbank, 1999) offers guidelines and research to be considered by parents and professional in working with twins and multiples. The themes that emerged deserve further

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investigation to be more fully understood by the learning community. Likewise, the learning community stands to benefit by considering the ways it consciously or unconsciously treats twins in formal and non-formal learning situations.

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